

REMARKS

In the Office Action dated November 30, 2004, Claims 1, 5, 20, 69 and 72 were rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. 5,889,874 to Schmitt *et al.* ("Schmitt"), and Claims 3-4, 6-8, 70-71 and 73-75 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Schmitt in combination with U.S. 5,712,058 to Malay ("Malay").

With the present amendment, independent Claims 1, 20 and 69 have been amended to specify that outer diameter dimension D1 is less than outer diameter dimension D2, and to further recite that "the outer diameter dimension of the battery is less than D2 over a substantial portion of the battery along its length dimension L." New dependent Claims 76, 78 and 80, which depend from Claims 1, 20 and 69, respectively, have been added to specify that "the outer diameter dimension of the battery is less than D2 over at least about one third of the battery along its length dimension L." New dependent Claims 77, 79 and 81, which depend from Claims 1, 20, and 69, respectively, have been added to specify that "the outer diameter dimension of the battery is less than D2 over about one half of the battery along its length dimension L." Support for these changes can be found in the application at, for example, Fig. 9 and the related text, which shows and describes a battery having an outer diameter dimension which varies from smaller diameter D1 to larger diameter D2, and in which the outer diameter dimension over about one third of the battery is less than D2. Support can also be found in the application at, for example, Figs. 12-15 and the related text, which illustrate and describe a battery having an outer dimension which varies from smaller diameter D1 to larger diameter D2, and in which the outer diameter dimension over about one half of the battery is less than D2. No new matter has been added by way of these amendments.

With the entry of these amendments, it is believed that the Examiner's § 102 and § 103 rejections are overcome, and that all claims are allowable. The independent claims have all been amended to specify that "the outer diameter dimension of the battery is less than D2 over a substantial portion of the battery along its length dimension L." New dependent claims 76-81 have been added to specify that the substantial portion of the battery is greater than one third, or about one half, of the battery along its length dimension, L. It is respectfully submitted that these amendments render the presently-claimed batteries patentably distinguishable from conventional

batteries used in hearing devices, which are generally “button” or “can” shaped, and which are the subject of the cited Schmitt and Malay references.

As an example, compare the hearing devices shown in Figs. 11 and 14 of the present application. Both Fig. 11 and Fig. 14 are cut away side views of one of the half-shells 74 which house the receiver, battery and the microphone in a hearing device. The battery 24A shown in Fig. 11 is a standard zinc-air cell which has a substantial cylindrical geometry. Typically, the construction of these zinc-air cells consist of an air cathode can, an anode can, insulators, and an electrolyte. The battery 24A illustrated in Fig. 11 is a conventional 312 zinc-air cell which has been found to be the largest conventional cell that would fit inside of the battery compartment formed by a pair of half-shell 74.

In comparison, an inventive custom made battery 24B in accordance with the present invention is shown positioned in a hearing aid half-shell 74 in Fig. 14. This custom made battery is further illustrated in the perspective views of Figs. 12 and 13. More particularly, Fig. 12 shows the bottom B of the anode A while Fig. 13 illustrates the top T of the cathode C. It is noted that relative to the conventional zinc-air cell, such as in Fig. 11, the anode can is lengthened and tapered. Additionally, the radial dimension of the battery is increased which allows the battery to better fill the available cavity in shell 74.

To facilitate the change in the radial dimension, the cathode can height is minimized so as to reduce the adverse, double-packaging affect attributable to the anode can, insulator, and cathode can construction. As is evident from Fig. 14, if a full-height cathode can were used, the radial dimensions of the anode can would have to be smaller than proposed, and consequently, the capacity of the custom battery would necessarily be reduced. Therefore, the height of the cathode can is as small as possible while still maintaining an adequate seal. The net effect of these changes may be observed by comparing Fig. 14 to Fig. 11. It is seen that the custom battery 24B occupies a much larger fraction of the space available for the power source. In fact, by calculating the volumes of the custom battery 24B and comparing it to the standard 312 24A cell, a quantitative measure of the increased capacity may be obtained. In doing so, a volume of 0.01757 in^3 for the custom battery was calculated that is contrasted to the 0.008719 in^3 volume of the standard 312 cell. Since the battery volume has increased by over 100%, the life of the hearing aid will approximately double. This is particularly advantageous for low-cost

“disposable” hearing devices, since these devices are designed such that the batteries are permanently housed within the hearing aid shell, and are not replaceable. Thus, by increasing the life of the hearing aid, the useful life of the hearing aid as a whole is simultaneously increased.

A second embodiment of an inventive custom designed hearing aid battery is shown in Fig. 9. Again, to obtain the maximum life from the battery 24, the housing for the battery conforms closely to the internal shape of the ear canal, and includes at least one step 92 such that the overall shape of the battery substantially conforms to a portion of the ear canal between the aperture and the first bend. This allows the battery life to be extended by increasing the total zinc volume.

In both of these exemplary embodiments of the invention (Figs. 12-15 and Fig. 9), the battery includes a outer diameter dimension which varies from D1 to D2 along the length of the battery, and in which the outer diameter dimension is less than D2 over a substantial portion of the battery along its length. As a result of this novel design, the radial dimension of the battery can be increased at one end of the battery to more effectively fill the available space in the hearing aid shell, while the other end of the battery is lengthened and tapered to better conform to the shape of the ear canal as the canal narrows between its aperture and the first bend of the ear canal. Furthermore, these modifications result in increased overall volume for the battery, as compared to conventional button-shaped cells, which advantageously results in a longer useful life for the battery and in some cases, the entire hearing device.

These features are not taught or suggested by the primary Schmitt reference, which describes an ITE hearing device having a replaceable battery 16. The Examiner cites Fig. 1 as showing a battery as recited in independent Claims 1, 20 and 69. However, this figure appears to show a conventional “can” or “button” shaped cell, and Schmitt does not teach or suggest a battery as presently claimed. The Examiner may have believed that the slight indentation near the bottom surface of the battery 16 in Schmitt constitutes the variation in outer diameter dimension, D1 to D2, as recited in the claims. However, the present amendments foreclose that possibility, since the claims now specify that “the outer diameter dimension of the battery is less than D2 over a *substantial portion* of the battery along its length dimension L.” This is clearly not the case in the Schmitt patent, which appears to show, at best, a slight indentation of the battery over a minuscule fraction of its overall length at one end. The battery in Schmitt is more

similar to the battery shown in Fig. 11 of the present application, which is a conventional 312 zinc-air cell, than to the custom-made batteries of the present claims, which are shown in Figs. 9 and 12-15.

Furthermore, the deficiencies with respect to the primary Schmitt reference are not overcome by the secondary Malay reference. Malay discusses a miniature galvanic cell with a particular cover-gasket assembly. (See Abstract). In the Office Action, the Examiner cites Malay as purportedly disclosing a battery with a step, as recited in dependent Claims 3 and 70. However, like the primary Schmitt reference, Malay fails to teach or suggest the limitation that “the outer diameter dimension of the battery is less than D2 over a *substantial portion* of the battery along its length dimension L,” as is recited in Claims 1, 20 and 69. Again, this is clearly not the case in the Schmitt patent, which appears to show, at best, a slight indentation of the battery over a minuscule fraction of its overall length at one end. The purpose for this indentation is not described, although it is likely that this feature is simply provided as a guide rabbet for the battery to mate with a recessed electrode in the battery’s housing. The battery in Malay is similar to the conventional “button” or “can” shaped batteries shown in both the Schmitt reference and in Fig. 11 of the present application, and does not describe or suggest the custom-made batteries that are the subject of the present claims.

The applicants further dispute the Examiner’s argument that Schmitt and/or Malay render Claims 4 and 71 obvious, which recite that the hearing aid is disposable. Schmitt clearly and unequivocally teaches that its battery is “replaceable,” (see col. 2, line 64 through col. 3, line 16; Fig. 3), and therefore teaches away from a “disposable”-type hearing aid. Malay is directed to a battery *per se*, and contains no teaching or suggestion of a disposable hearing device. Applicant’s disagree with the Examiner’s unsupported statement that providing a low-cost disposable hearing aid is both “well-known” and “would have been obvious,” particularly since the references actually cited by the Examiner appear to teach exactly the opposite.

Accordingly, it is believed that the Examiner’s § 102 and § 103 rejections are overcome, and that all claims should be allowed.

Information Disclosure Statement

An Information Disclosure Statement (IDS) was filed on January 4, 2005. Entry of the IDS is respectfully requested.

CONCLUSION

In view of the above amendments and remarks, it is believed that all claims are in condition for allowance, and it is respectfully requested that the application be passed to issue. If the Examiner feels that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned.

Respectfully submitted,

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